

OCCASIONAL PAPERS
OF THE
California Academy of Sciences

No. 98, 7 pages, 7 figures.

A CAVERNICOLOUS WHIP-SCORPION FROM
THE NORTHERN MOJAVE DESERT, CALIFORNIA
(Schizomida: Schizomidae)

By

Thomas S. Briggs

Research Associate, California Academy of Sciences
and Galileo High School, San Francisco, California

and

Kevin Hom

Galileo High School
San Francisco, California

An early winter collecting trip to the desert east of Death Valley, California, revealed a new species of schizomid in a remarkably isolated thermal cave habitat. The discovery of this little whip-scorpion extends the range of schizomids in California farther to the northeast and places them in an environment considerably different from the leaf litter or rocky epigeal habitats of other southwestern species. The nearest schizomid record to the south is approximately 200 kilometers distant, separated by wide stretches of desert and to the west approximately 217 kilometers distant, separated by desert and the Sierra Nevada. Records of whip-scorpions of the genus Schizomus and genus Agastoschizomus have been reported from tropical caves in Mexico by Chamberlin and Ivie (1938) and Rowland (1971a) but this is the first cavernicolous record of a schizomid from the Temperate Zone.

The addition of this new species, Trithyreus shoshonensis, increases the number of described species of Schizomida in

the United States to eight. A male of T. shoshonensis resembles specimens of Trithyreus belkini McDonald and Hogue and Trithyreus joshuensis Rowland in Rowland's key (1971b) in having a mesal spur located apically on the tibia of the pedipalp. It differs from these species in having a bilobate flagellum that is distinctively setose and a pair of broadened setae on the last abdominal segment.

All specimens are deposited in the collection of the California Academy of Sciences.

Trithyreus shoshonensis Briggs and Hom, new species.

HOLOTYPE. Male. Total length (apex of carapace to tip of flagellum), 4.83 mm. Carapace and metapeltidium pale brown, mesopeltidium and first abdominal tergite darker brown, abdominal terga brown, chelicerae and pedipalps reddish brown. Legs brown with pale trochanters.

Cephalothorax. Carapace translucent, with vague eye spots, strongly convex, anteromedial cone with apical spine directed anterad and two dorsal setae, posterior half of carapace with pair of low setae rising from darkened zone of attachment; mesopeltidia separated by almost their length; metapeltidium bisected by distinct suture; anterior sternum pale, with 2 elongate setae on anterior margin and 11 shorter setae; posterior sternum with six setae.

Abdomen. Each tergite with two setae; last tergite with sclerotized spur directed caudad flanked dorsolaterally by two laterally compressed, twisted, reddish bristles on stout tubercles; book lung within base of second sternite bisected by medial rib.

Flagellum. Heart-shaped with lateral lobes swollen dorsad and separated by depressed median channel, mesodorsal margin of lateral lobes raised; with thirteen major setae; dorsal subcaudal surface with numerous small setae; stem with small setose tubercle on each side of midpoint. Length (excluding stalk) 0.53 mm., width 0.69 mm., depth 0.28 mm.

Chelicerae. Movable finger flanked on each side by group of four elongate, feathered setae; three elongate, distally swollen setae originate below feathered setae; movable finger with mesal row of apically roughened curled setae and row of minute mesoventral teeth. Fixed finger with mesal line of slightly feathered setae and four short teeth between apical tooth and basal tooth. Basal segment with distodorsal seta and subaligned lateral setae.

Pedipalps. Each with trochanter, femur, patella, and tibia elongate; trochanter not produced distally; patella narrow, sparsely setose; tibia with subapical mesoventral spur; tarsus with two lateral, subapical spines. Tibia and tarsus with feathered setae.

Legs. Tarsal formula 7-3-3-3. Legs relatively long (measurements in millimeters):

	I	II	III	IV	Pedipalp
Coxa	0.61	0.55	0.39	0.41	0.59
Trochanter	0.33	0.27	0.28	0.42	0.61
Femur	1.52	1.06	1.08	1.36	0.64
Patella	-	0.50	0.28	0.59	1.03
Tibia	1.86	0.69	0.52	0.98	0.53
Basitarsus	1.41	0.59	0.50	0.87	0.44
Tarsus	<u>1.09</u>	<u>0.49</u>	<u>0.58</u>	<u>0.67</u>	<u>0.44</u>
Total	6.82	4.15	3.63	5.30	3.84

ALLOTYPE. Female. Total length (apex of carapace to tip of flagellum), 5.23 mm. Similar to male except as follows:

Pedipalps. Pretarsal segments of normal length and width; tibia without spur.

Abdomen. Swollen; last segment without spur or enlarged setae.

Flagellum. Typical four segmented cylinder.

Legs. Slightly shorter than those of male:

	I	II	III	IV	Pedipalp
Coxa	0.50	0.42	0.36	0.38	0.56
Trochanter	0.30	0.20	0.23	0.36	0.44
Femur	1.22	0.87	0.85	1.16	0.72
Patella	-	0.52	0.31	0.53	0.55
Tibia	1.47	0.56	0.45	0.86	0.38
Basitarsus	1.06	0.50	0.47	0.56	0.38
Tarsus	<u>0.94</u>	<u>0.47</u>	<u>0.42</u>	<u>0.47</u>	<u>0.38</u>
Total	5.49	3.54	3.09	4.32	3.03

TYPE DATA. Holotype male and allotype female. Upper Shoshone Cave, near Shoshone, Inyo County, California, 28 December 1971 (W. Rauscher, E. Fogarino, and T. Briggs). Paratype female and juvenile also collected, same data. Collected on floor of main passage.

Note. The juvenile was close to its last instar and possessed an unsegmented flagellum having lateral swellings near the base of a cylindrical body.

DISCUSSION OF HABITAT

The survival of these whip-scorpions would not be possible in the saltbush desert with its freezing winters were it not for the peculiar conditions in upper Shoshone Cave. This cave and those nearby are deep fissures in dark grey Cambrian limestone of the Nopah Formation. At 1800 feet (550 meters) elevation these caves escaped flooding by Lake Tecopa during the Pleistocene (Blanc and Cleveland,

1961). The cave walls display a mosaic pattern of hematite veins that apparently were sought during a brief mining operation. Most important, the caves are heated by thermal ground-water that may be part of the Ash Meadows system which extends beneath a vast area in southern Nevada (Maxey and Mifflin, 1966). This regional flow system could have supplied constant heat and moisture to the caves during the Pleistocene and before.

The temperature of a small thermal spring at the bottom of lower Shoshone Cave measured 30.0° C. in agreement with 29.4° C. recorded by Emerson (1951). Upper Shoshone Cave had an air temperature of 26.1° C. at the accessible bottom and 24.4° C. 18 feet (5.5 meters) from the surface where the uppermost schizomid was observed. The lower cave was cooler (22.4° C.) in spite of the hot pool and yielded no schizomids. Humidity was near 100 percent at the floor of the upper cave since most surfaces were moist. A steady current of humid air flowed out of the vertical entrance.

Whip-scorpions were collected under and about wood debris on the floor of upper Shoshone Cave about 45 feet (14 meters) from the surface. Other arthropods living in this habitat were pale camel crickets (*Ceuthophilus*), white isopods, pseudoscorpions, clubionid spiders, small millipedes, collembolids, and an obligate cavernicolous phalangid (*Phalangodidae*) which will be described in a separate paper. A second visit to the cave by W. Rauscher, A. Jung, J. Nishio, and T. Briggs on January 23, 1972, found one specimen of *Trithyreus* (female) 18 feet (5.5 meters) from the surface and none on the cave floor. This specimen was not collected because of our concern about the apparent small size of the population.

The temperature and humidity of the Shoshone Caves resemble that in the caves of the San Luis Potosi area in Mexico, presently being studied by Mitchell and Reddell (1971). The average temperature in caves of the Sierra de El Abra, reported by Mitchell (1969) in a cave comparison study, is 24.5° C. and their faunal composition is close to that of the above list. Schizomid whip-scorpions are present in these Mexican caves, so the environmental resemblance by upper Shoshone Cave may explain why *Trithyreus shoshonensis* survives in it. The obligate cavernicole status of the schizomids in the Shoshone Caves is assured by the harsh desert surrounding them. This differs from the situation pertaining in the Mexican caves.

A nearby cave in Death Valley National Monument was also investigated. This cave, Titus Canyon Cave, was not quite as warm at the bottom (22.0° C.) where the humidity was 100 percent. Cavernicolous arachnids were not found, possibly due to soluble salt that encrusted most surfaces. Since this is about the only other cave in the northern Mojave Desert known to be of a thermal nature the fauna of the Shoshone Caves may be quite singular and should be protected. To appreciate the delicate aspect of this habitat one need only consider what might happen to the temperature and humidity balance if water were pumped for irrigation from the vicinity of the cave. Death Valley National Monument

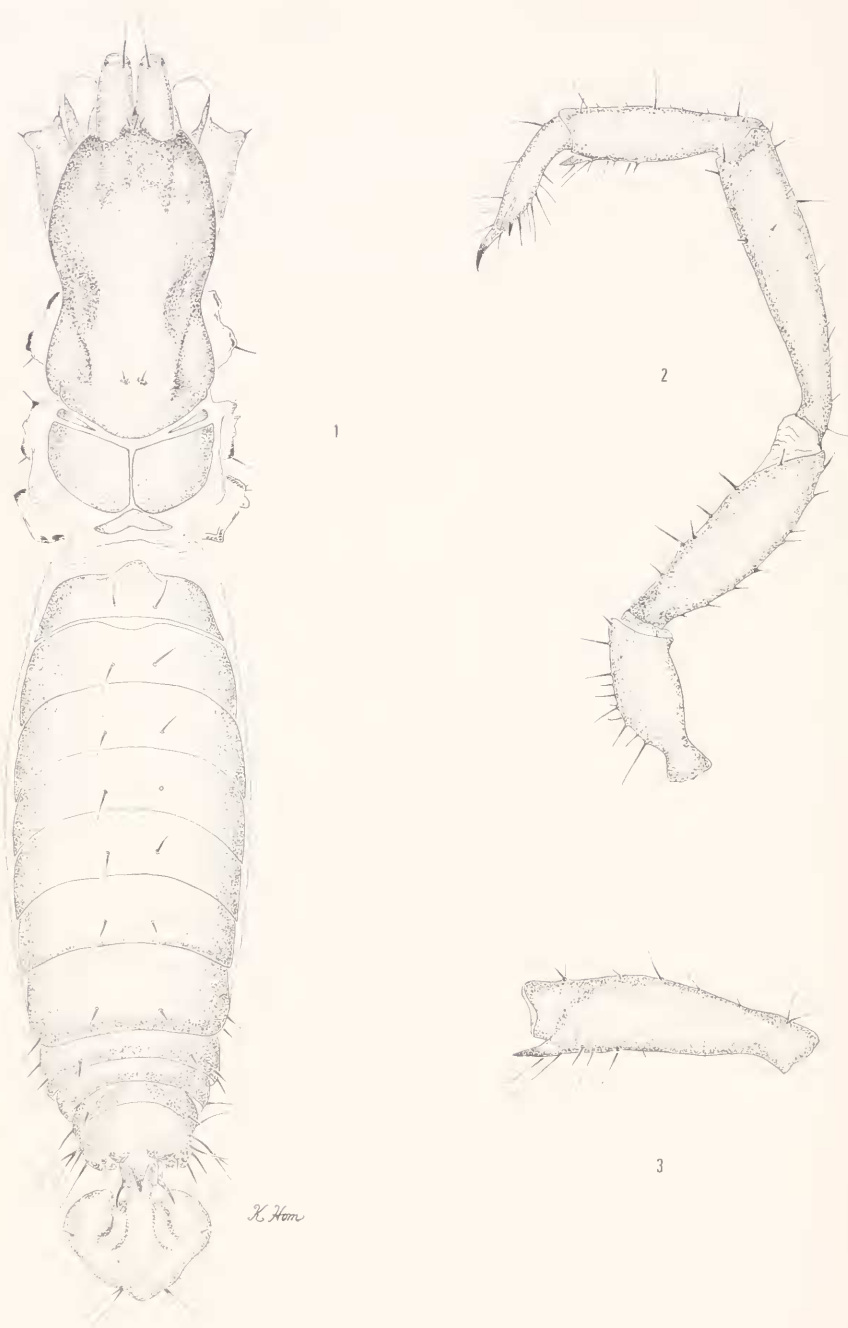
should annex this cave as it has acquired other endangered caves.

ACKNOWLEDGMENT

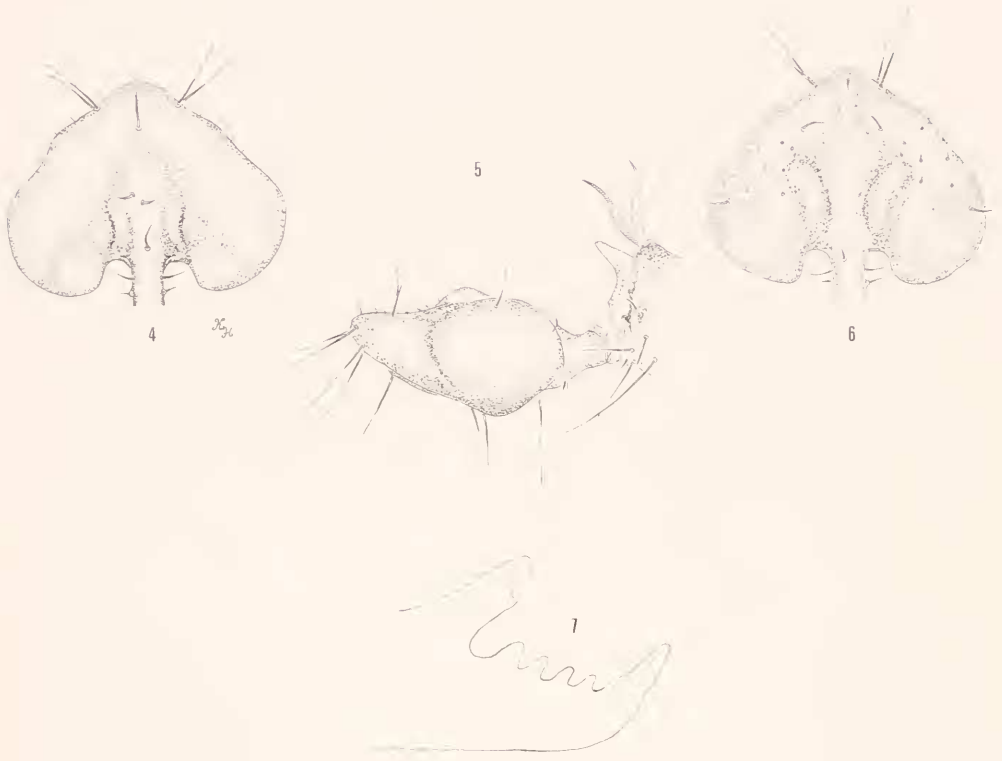
We thank Mr. Peter Sanchez, acting superintendent of Death Valley National Monument, for arranging a visit to Titus Canyon Cave, and Miss Jane Nishio for her assistance.

LITERATURE CITED

- BLANC, R. P., and G. B. CLEVELAND.
1961. Pleistocene Lakes of Southeastern California
- I. Mineral Information Service, vol. 14,
no. 4.
- CHAMBERLIN, R. V., and W. IVIE.
1938. Arachnida of the Orders Pedipalpida, Scorpionida
and Ricinulida. Carnegie Institute of Washing-
ton Publication 491, pp. 101-107.
- EMERSON, D.
1951. Shoshone Cave. California Caver, vol. 3, no. 3,
p. 2.
- MAXEY, G. B., and M. D. MIFFLIN.
1966. Occurrence and Movement of Ground Water in Car-
bonate Rocks of Nevada. National Speleological
Society Bulletin, vol. 28, no. 3, pp. 141-157.
- MITCHELL, R. W.
1969. A Comparison of Temperate and Tropical Cave
Communities. Southwestern Naturalist, vol.
14, no. 1, pp. 73-83.
- MITCHELL, R. W., and J. REDDELL.
1971. Studies on the Cavernicole Fauna of Mexico.
The Speleo Press, Austin, Texas, 239 pp.
- ROWLAND, J. M.
1971a. New Species of Schizomids (Arachnida, Schizomida)
from Mexican Caves. Pp. 117-126 in R. W.
Mitchell and J. Reddell.
- 1971b. A New Trithyreus from a Desert Oasis in Southern
California. Pan-Pacific Entomologist, vol. 47,
no. 4, pp. 304-309.



FIGURES 1 to 3. Male holotype, Trithyreus shoshonensis Briggs and Hom, new species. FIGURE 1. Dorsum. FIGURE 2. Ectal view of pedipalp. FIGURE 3. Mesal view of tibia of pedipalp.



FIGURES 4 to 7. Male holotype, Trithyreus shoshonensis Briggs and Hom, new species. FIGURE 4. Venter of flagellum. FIGURE 5. Lateral view of flagellum. FIGURE 6. Dorsum of flagellum. FIGURE 7. Fixed finger of chelicera, setae omitted.